Kurasono KYODA*: A new record to grass flora of Japan, a panicoid C_3 species, *Sacciolepis myosuroides***

許田倉園*: 日本産イネ科キビ亜科 C_3 植物の一新記録 — ハラヌメリ**

In the course of studies on the Asiatic grasses, the author came across with several noteworthy additional facts something new to the knowledges of grass flora of Japan. This is a part of results based mainly on examinations of specimens deposited in the Herbarium of National Science Museum, Tokyo (TNS). The Nepalese specimens which were sent to Tamagawa University for identification, by courtesy of Professor H. Tabata of Kyoto University, were also used.

A small panicoid genus, *Sacciolepis*, is taken into account together with its distribution and role of variation in the present study. The genus is an aquatic or wet moist-loving grasses, comprising 30 species (Clayton & Renvoize 1986) mainly centerd on South East Tropical Africa and West Tropical Africa (Simon 1972), but with some members widely growing in the warmer parts of Asia, Australia (Simon 1980) as well as South America (Parodi 1969). *Sacciolepis* is characterized by a contracted, spike-like panicle and by the saccate basal part of the upper glume with strongly elevated 7–9-veins (Fig. 1, B). The discoid tip of the pedicels (Fig. 1, A) also provided an easy diagnosis for identification of the genus separating it from other member of the tribe Paniceae.

According to Simon (1972), there are 25 species of *Sacciolepis* found in Tropical Africa, where sixteen species are concentrated in Flora Zambesiaca area. Only one representative species and one variety were reported to be native in Japan (Ohwi & Kitagawa 1983). Two species and one variety were known in China (Keng 1933), including Hongkong, Taiwan and Hainan Islands (Hsu in Li 1978). *S. indica*, an extremely polymorphic common species, and *S. myosuroides*, a rather uncommon species, are widely distributed in the warmer parts throughout East Asia, and of South East Asia, Malesia, Polynesia, India (Bor 1960), New Guinea (Reeder 1948), Java (Backer & Brink 1968) and Australia

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** Contribution in honor of the late Dr. Hiroshi Hara.

(Vickery 1975). The former species is said to be naturalized in North America (Hitchcock 1951) and Africa.

Hooker (1897) recognized seven varieties under *Panicum indicum* in his "Flora of British India", in which var. *indicum*, var. *angustum* and var. *villosum* were transferred to the genus *Sacciolepis* by Chase (1908) for the basic name, by Keng (1959) for the slender Chinese specimens, and by Ohwi (1971) for the hairy Siamese samples, respectively.

Observation Var. *angusta* is characterized by very slender erect culms which is single or a few in tuft, usually with diameters less than 0.5 mm. The internodes are more or less elongated with more than 6 nodes, and the inflorescences of 0.5-2(-5) cm long. This is a starved form growing in the border regions of the distribution range of the species (Fig. 2). All specimens of this form bear setaceous spikelets and are said to be collected in terrestrial wet soils instead of shallow water. It is worthwhile to mention that the internodes are always much longer than the leaf-sheath throughout the whole culm even they are at basal nodes. The flowering season is concentrated mainly in September. They are cool-adapted and found in the northern parts of Honsyu. One collection is found in Kyusyu at a rather high-elevated locality, Aira (姶良郡) of Kagoshima, near by Mt. Kirishima (alt. 1700 m).

Var. *oryzoides* is separated by its caespitose and stout culm-bases which are more than 2 mm in diameter and less than 4-noded. The internodes are very short, contracted and hidden within the leaf-sheaths. Thus the whole plant tufted with basal leaves. The leaves are elongated and are usually extended over the inflorescences. The panicles are 3-10(-17) cm long with some inflorescences born amongst the foliages. This variety is found in aquatic habitat, and the spikelets are either glabrous or setaceous. The flowering season is between September and November and is fairly longer than that of other varieties.

Var. *indica*, a typical form of *S. indica*, and *S. myusuroides* have the internodes elongated, with more than 5 nodes and rather hard. The leaves are rather far aparted on each node, but sometimes with basal 3-nodes bearing longer leaf-sheaths, yet never concentrated at the basal part forming radical-like appearance. The culm is distinct and each terminates in an inflorescence. This, might be as giant as 1 m high or more in the tropical specimens. The culms become thicker and stouter, associated with longer leaves, in the tropical regions, south of Ryukyus. No leaves are seen exceeding beyond the inflorescences.

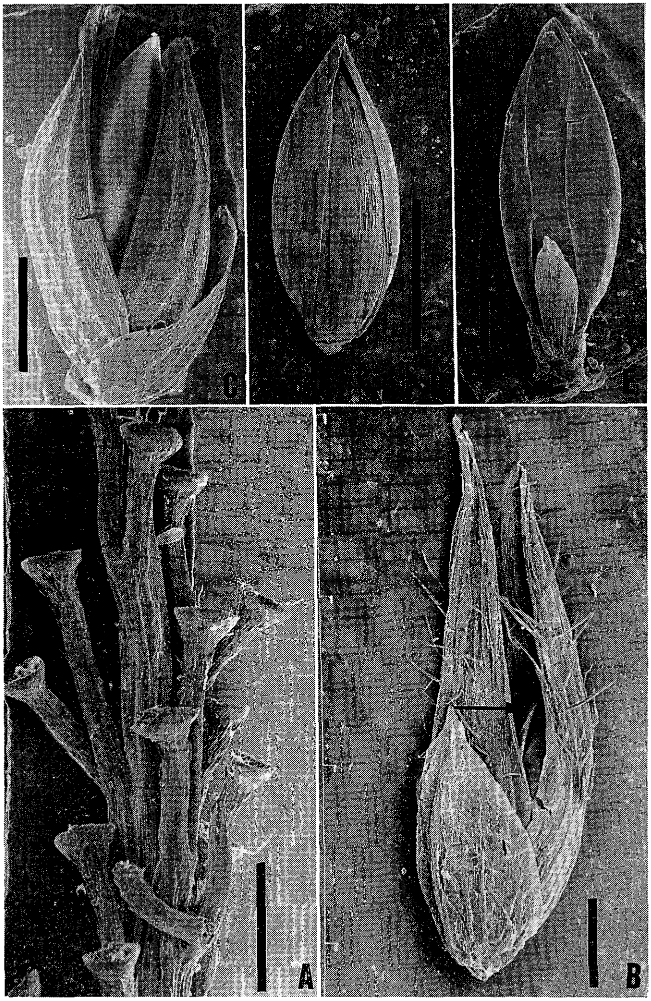

Fig. 1. SEM microphotograph of part of an inflorescence (A), spikelets (B, C), and anthecia (D, E). A, B, E. *Sacciolepis indica*; C, D. *S. myosuroides*. A, showing the discoid tip of the pedicels; B, showing a saccate spikelet, setaceous upper glume and lower lemma, inside is an anthecium (indicates with an arrow mark) which is about 1/2 of the length of the spikelet; C, showing an ovoid spikelet with an anthecium visible in between the upper glume and the lower lemma, which is nearly as long as the spikelet; D, E, showing an anthecium with upper part of margins free, and in E, a very much reduced lower palea is attached at the base of the anthecium. Each black bar indicates 0.5 mm long.

The flowering season of var. *indica* is August to October in Japan, but Wu (1984) reported that the flowering season is between May and August and the variety is found in localites of high elevations as 2700 m above sea level in Yunnan, a highland of China.

Among the specimens of *S. indica*, *S. myosuroides* is discovered for the first time in the southern part of Kyusyu. It is a new record for Japan. The species is distinct with conspicuously ovoid, nearly glabrous, non-saccate spikelets of 1.5–1.8 mm long. The upper floret is nearly as long as the spikelet or a little shorter than it. The inflorescence is crowded with spikelets, and the basal part is attenuated due to the presence of the abortive spikelets. It gives an outstanding feature of slender panicle which is 8–18 cm long by 3 mm in diameter. The same species are newly confirmed also in Taiwan and Hongkong. The occurrence of this species has not been known because of a single species representative in the area. This is a plant reported flowering in June and is growing in lowland and at elevations between 500 m and 850 m in Yunnan, China (Wu 1984). However, the specimens collected from Taiwan, Hongkong and Nepal indicated the flowering season of October and November.

All these observations are summerized in the following key together with taxonomic notes.

Key to the species and varieties of genus *Sacciolepis* found in Japan

1. Spikelets ovoid, acute or subobtuse at the apex, 1.5–1.8 mm long, usually glabrous; upper floret nearly as long as the spikelet; panicle 8–18 cm long with attenuate base, 3 mm in diameter; basal leaf-sheaths spongy .... *S. myosuroides*
1. Spikelets lanceolate-ovate, saccate at base, acute to acuminate at apex, 2.2–3 mm long, setaceous or glabrous; upper floret about 1/2 as long as the spikelet; panicles 0.5–17 cm long, cylindrical, 4–5 mm in diameter.. *S. indica*
   2. Blades less than 4 mm wide; culms less than 1.5 mm in diameter, more than 5-noded; internodes more or less elongated; panicles 0.5–7 cm long, usually extruding leaves.
      3. Spikelets setaceous; culms very slender, less than 0.5 mm in diameter, internodes much longer than the leaf-sheath throughout culms; panicles 0.5–5 cm long, usually about 2 cm long .... var. *angusta*
      3. Spikelets glabrous or setaceous; culms more than 1 mm in diameter;

internodes shorter than the leaf-sheaths at least on the basal 3-internodes; panicles 3–7 cm long, usually 5 cm long ....var. *indica*

2. Blades 4–7 mm wide; culms more than 2 mm in diameter, less than 4-noded; internodes contracted at culm-base, shorter than the leaf-sheath; panicles 8–10(–17) cm long, usually with some panicles born among the foliage; spikelets setaceous or glabrous .... var. *oryzetora*

Sacciolepis indica (L.) A. Chase in Proc. Biol. Soc. Wash. **21**: 8, 1908; Reeder, Jour. Arnold Arbor. **29**: 282, 1948; Hitchcock, Man. Grass. U.S. 708, 1951; Keng, Grass. China, 313, 1933 et in Fl. Ill. Pl. Prim. Sinic. Gram. 662, 1959; Bor in Dansk Bot. Arkiv **20**: 165, 1962; Hsu in Li, Fl. Taiwan **5**: 598, 1978.

S. spicata (L.) Honda in Journ. Fac. Sci. Imp. Univ. Tokyo, Sect. III, Bot. **3**: 261, 1930.

var. **angusta** (Trin.) Keng, Fl. Ill. Pl. Prim. Sinic. Gram. 662, 1959.

Panicum angustum Trin., Sp. Gram. Ic. t. 334, 1836.

S. angusta (Trin.) Stapf in Prain, Fl. Trop. Afr. **9**: 763, 1920; Bor, in Dansk Bot. Arkiv **20**: 164, 1962; Ohwi in Tonan Ajia Kenkyu (The Southeast Asia Studies) **9**: 208, 1971.

Nom. Jap.: Hoso-Hainumeri (ホソハイヌメリ. Nom. Jap. nov.).

Distr.: Type from Nepal; Japan, Korea, China and India.

Representative specimens: Japan: Morioka (Toba 364, TI); Nikko (Nakamura in 1936, TI); Korea: Gwangneung (光陵, Nakai 13232, TI).

var. **indica**

Distr.: Type from India; Nepal, South East Asia, Polynesia, south to Australia, China (Kiangsu, Anhwei, Hopei, Kiangsi, Szechuan, Kueichou, Kuangsi, Hainan, Kwangtung, Yunnan, and Taiwan) and Japan.

Representative specimens: Nepal: Iladanda-Hellok (Kanai et al. 6302404, TI); Micronesia: Palau Isl. (Tuyama in 1937, TI); Philippines: Luzon (Merrill 315, TNS); China: Hainan Isl. (Lee in 1916, TI); Korea: Hyeoando (平安道), Uchiyama in 1902, TI).

var. **oryzetora** (Makino) Ohwi in Bull. Tokyo Sci. Mus. **18**: 3, 1947; Hsu, in Li, Fl. Taiwan **5**: 598, 1978.

Panicum indicum L. var. *oryzetorum* Makino in Bot. Mag. Tokyo **27**: 28, 1913.

S. oryzetora Honda in Bot. Mag. Tokyo **37**: 118, 1923 et in Journ. Fac.

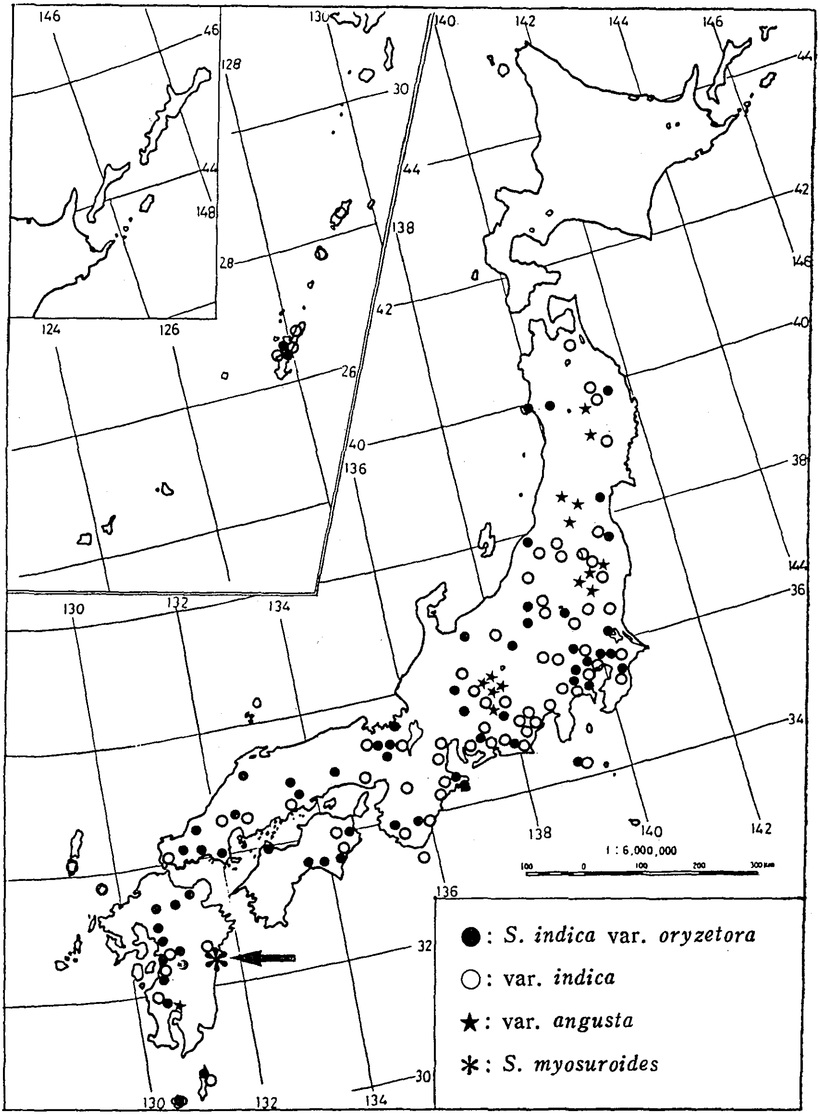

Fig. 2. A map showing the distribution range of the species and varieties of the genus *Sacciolepis* in Japan. One dot means one collection.

Sci. Imp. Univ. Tokyo, Sect. III, Bot. **3**: 260, 1930.

Distr.: Type from Japan; Korea and China (Anhwei, Kiangsu, Chekiang, Kwangtung, and Taiwan).

Representative specimens: Korea: Quelpaert (Taquet 1716, TI); China: Kwangtung (Tang 20666, TI); Ningpo (Chang in 1908).

Sacciolepis myosuroides (R. Br.) A. Camus in Lecomte, Fl. Gen. Indo-Chin. **7**: 460, 1922; Reeder, Journ. Arnold Arbor. **29**: 281, 1948; Keng, Grass. China 313, 1933 et in Fl. Ill. Pl. Prim. Sinic. Gram. 662, 1959; Wu, Index Fl. Yunnan. **2**: 2186, 1984.

P. myosuroides R. Br., Prodr. Fl. Nov. Holl. 189, 1810.

Hymenachne myosuroides (R. Br.) Balansa in Morot, Jour. de Bot. **4**: 143, 1890.

Nom. Jap.: Hara-numeri (ハラヌメリ. Nom. Jap. nov., the name is dedicated to the late Prof. Hiroshi Hara).

Distr.: Type from Pacific Islands; Japan, China (Kwangtung, Hainan, Kuangsi, Yunnan, and Taiwan), South East Asia, India, Malesia, Java, Polynesia, New Guinea and Australia.

Representative specimens: Japan: Kyusyu, Hyuga, Kawaminami-chio (Nagasawa in 1952, TNS 116512); Taiwan: Taoyuen (Sasaki in 1925, TNS 173898-99); Hongkong: Highland, N.T. (Hu 8245, TI); Nepal: Trisuli, alt. 636 m (Tabata et al. 8505, Tamagawa); Dumhan to Taplejung (Hara et al. 6302402, TI).

Discussion The tribe Paniceae is a unique group among the panicoid grasses. It is well characterized by having spikelets containing two florets, of which the upper anthecium is more or less firmer and thicker than the lower floret and glumes subtended. Hsu (1965) pointed out that the epidermal pattern of the anthecium of *Sacciolepis* is quite smooth with so called "Ms-type" shining surface. The enrolled margins of the upper lemma enclose the upper palea at the basal part, but is free at the distal part. These characteristics have never seen in the genera such as *Setaria*, *Pennisetum* and *Hymenachne* of which the panicles are also spiciform. The former two genera have the anthecia rugose or papillate throughout, while the latter bears silica body with flat, membranous margins. Pohl & Lersten (1975) gave another key character for distinguishing *Hymenachne* from *Sacciolepis* by occurence of aerenchyma inside the center of the culm. The pith region of *Hymenachne* species are filled with aerenchyma, but is absent or nearly so from *Sacciolepis* species.

The saccate spicklets are also found in *Cyrtococcum*, and somewhat saccate in members of Sect. Trichoides of genus *Panicum*, such as *P. brevifolium*. These species are separable by their open and capillary panicle branches. The anthecium is gibbose and strongly laterally compressed in the genus *Cyrtococcum*. The upper glume is nearly as long as the spikelet in *P. brevifolium*, separating it from the genus *Sacciolepis*.

S. indica shows a non-Kranz leaf anatomy. The $^{13}C/^{12}C$ ratio value of -26.1 was measured by Brown (1977). Using the Japanese materials, Takeda et al. (1985) reported the CO_2 compensation point is 20 ppm, with fairly long interveinal distance of 153 μm and mestome-anatomy. Similar values of 31 ppm, 139 μm, and mestome-anatomy were measured on var. *oryzetora* by the same authors. Undoubtly the members of the genus *Sacciolepis* are C_3 in nature, though typically with panicoid spikelets.

Some members of the genus *Sacciolepis*, especially *S. curvata* and *S. striata*, are difficult to separate them from Sect. Trichoides of *Panicum*, due to the characteristics of open panicle and saccate upper glume. It is noteworthy to mention that these taxa are all belonging to C_3, yet differing to those of C_3 festucoid grasses anatomically in having mesophylls radiately arranged (Tateoka 1956). All of them are shade-loving, bearing rather thin, more or less broader leaves which are ovate to linear-lanceolate in shapes.

It is suggested that the reexamination of lemmatal patterns (Hsu 1965) and lodicules (Hsu 1963) might give a solution to the proper systematic position of these panicoid C_3 grasses. Those genera represent in Asiatic region are as follows: *Cyrtococcum*, *Eriochloa*, *Hymenachne*, *Ichnanthus*, an *Paspalidium*, most of them are C_3, but there are C_4 representatives. Clayton & Renvoize (1987), however, pointed out that some members of the genera, including *Sacciolepis*, are not easy to key out from genus *Panicum*. Both anatomical and gross morphological investigations on these panicoid C_3 genera are greatly needed.

Literature cited

Backer, C.A. & B.C.B. van den Brink 1968. Flora of Java, vol. 3: 557. Bor, N.L. 1960. The grasses of Burma, Ceylon, India and Pakistan. 767p. Pergamon Press. Brown, W.V. 1977. The Kranz syndrome and its subtypes in grass systematics. Mem. Torrey Bot. Club **23**(3) : 1-97. Gilliland, H.B. et al. 1971.

Grasses of Malaya. 319p. Singapore. Hitchcock, A.S. 1951. Manual of the grasses of United States. 1051p. U.S. Dept. Agr. Misc. Publ. 200. Hooker, J.D. 1897. Flora of British India, vol. 7. Reeve & Co., Kent. Hsu, C. 1963. A study on Formosan *Panicum*, with special reference to their lodicules. Journ. Jap. Bot. **38**: 75–86. —— 1965. The classification of *Panicum* (Gramineae) and its allies, with special reference to the characters of lodicules, style-base and lemma. Jour. Fac. Sci. Univ. Tokyo Sec. 3. **9**: 43–150. —— 1978. *In* Li, Flora of Taiwan, vol. **5**: 597–598. Keng, Y.L. 1933. The grasses of China. Ph. D. thesis, George Washington Univ. —— 1959. Flora illustrata plantarum primarum Sinicarum, Gramineae. 1178p. Sci. Press, Peking. Ohwi, J. 1971. Contributions to the flora of Southeast Asia. V. Gramineae and Cyperaceae of Thailand. Tonan Ajia Kenkyu (The Southeast Asia Studies) **9**(2): 194–219. —— & M. Kitagawa 1983. Flora of Japan. Shibundo, Tokyo. Parodi, L.R. 1969. Estudio sistematicos sobre las Gramineae-Paniceae Argentinas y Uruguayas. Darwiniana **15**: 65–111. Pohl, R.W. & N.R. Lersten 1975. Stem aerenchyma as a character separating *Hymenachne* and *Sacciolepis* (Gramineae, Panicoideae). Brittonia **27**: 223–227. Reeder, J.R. 1948. The Gramineae-Panicoideae of New Guinea. Jour. Arnold Arbor. **29**: 257–392, Pl. 1–7. Simon, B.K. 1972. A revision of the genus *Sacciolepis* (Gramineae) in the "Flora Zambesiaca" area. Kew Bull. **27**(3): 387–406. —— 1980. A preliminary check-list of Queensland grasses. Tech. Bull. No. 5. 77. Queensland Dept. Primary Ind. Brisbane, Australia. 武田友四郎・谷川孝弘・県 和一・箱山 晋 1985. イネ科 C_3, C_4 植物の生態と地理的分布に関する研究. 第一報. 日本におけるイネ科 C_3, C_4 植物の分類ならびに気象条件による地理的分布. Japan. Crop. Sci. **54** (1): 54–64. Tateoka, T. 1956. Reexamination of anatomical characteristics of the leaves in Eragrostoideae and Panicoideae (Poaceae). Journ. Jap. Bot. **31**: 210–218. Vickery, J.V. 1975. Flora of New South Wales. No. 19. part 2: 188. Nat. Herb. New South Wales, Sydney. Wu, C.-Y. 1984. Index florae Yunnanensis, vol. 2: 2186. Kunming.

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日本産ヌメリグサ属について，近隣地域のものと比較検討した。ハラヌメリは九州の宮崎県川南町で長沢光男氏が昭和27年9月24日に採集したもので，小穂が小粒で卵形，上位小花がほぼ小穂と同じ長さで，明らかにヌメリグサと異なり，自生と思われる。故原寛教授を記念して和名をつけた。この種類は台湾，香港やネパール産のヌメリグサの

標本のなかからも検出された。従来これらの地域では1属1種ということで，見落されたふしがある。節の数や節間の長さ，花序が葉から超出するか否か，上位小花が小穂の長さに占める割合などはこの属の識別に大事な特徴といえる。ホソヌメリは茎が極端に細く，分布の極限近くに生える貧弱な型で，日本産のものは皆小穂に剛毛があり，関東から東北地方にかけて見られるので変種として扱った。以上のように，日本には2種2変種が自生することになる。本研究に多大な便宜を計って頂いた科学博物館や東京大学資料館の諸先生方に感謝する。また，日頃標本の整理や研究に協力してくださった鍛代スミエさん，郡美恵さんに謝意をのべたい。

○若き日の原 寛博士の日記 (5)

5月10日 学校から帰りヲセソウの記載をかいた。（注：前年至仏山で採集）

5月16日 学校から帰宅後，4時出発。同25分発列車で平井と伊豆湯ヶ島に向ふ。今度の旅行は，来月2日陛下天城八丁池へ行幸のためその下調に来てくれとの事で行くことにした。午後8時40分修善寺着。直ちに自動車で湯ヶ島落合楼に行き投宿。

5月17日 午前6時起床，8時過出発。横田，内田氏等と自動車で杉本に至り，それより植物を教示しつつ八丁池に至り，昼食。隧道入口へ戻り，徒歩にて浄蓮滝に至り採集。6時半に宿に帰る。夕食後植物名を数え，11時就床。

10月1日 学校より帰宅後，4時より中目黒へ行き，川村先生を待ち，共に別荘に行き，カゴタケをみて7時帰宅。

10月4日 学校を終り直ちに品川を経て逗子に向ふ。1時20分着。荒井校長等と会ひ，逗子小学校教員の植物実地指導の講師として，神武寺裏口石切場に至り，38名の教員に指導しつつ登り，寺の所より本道を下り，沼間分教場に4時半着。それより菌に関する講演をし，種々質問を受け，6時半別荘に戻る。

10月16日 東京日日の朝刊に僕がカゴタケを発見した事についての記事が大きくでた。

11月21日 放課後3時より，理学会第9回例会に出席，菌に関する講演をした。

昭和5年（1930）植物採集旅行表

3月30日 紀伊御船，鮒田。31日瀞八丁。
4月1日 瀞八丁。2日新宮。27日伊豆天城，八丁池。28日浄蓮滝，猫越。
5月17日 伊豆天城，八丁池。31日軽井沢。
6月1日 軽井沢，小瀬。22日相州武山，大楠山。
7月12日 軽井沢川越石川谷。13日離山。14日川越石川谷。15日碓氷峠。
8月6日 上高地，徳沢閒。7日上高地，中ノ湯。21日南軽井沢。23日軽井沢湿原。25日妙義白雲山。
9月28日 上州水上。
10月4日 逗子神武寺山。5日神武寺山，桜山。19日日光中禅寺。20日中禅寺。 （終）